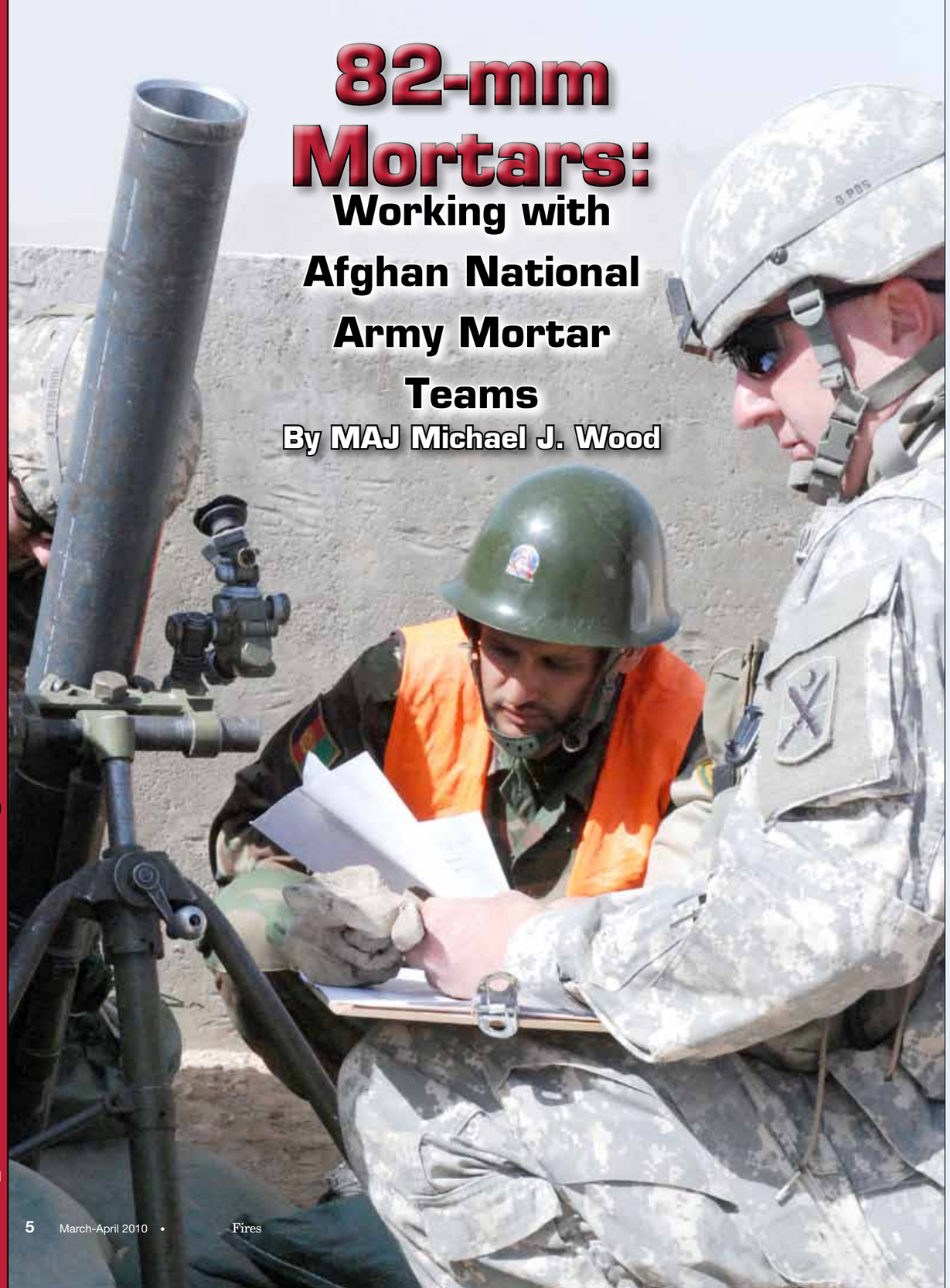
82-mm Mortars:

Working with Afghan National Army Mortar Teams

By MAJ Michael J. Wood



During the past two years, many Afghan National Army formations began taking the lead on executing missions with International Security Assistance Forces in Afghanistan. Even though the ANA is still dependent on coalition support for Fires, air support and medical evacuation, the ANA is capable of putting far more soldiers into an area during an operation than any International Security Assistance Force formation in Afghanistan. ANA soldiers are beginning to occupy combat outposts in platoon- and company-sized formations without International Security Assistance Force or other coalition forces.

Inevitably, these formations will bring some or all of their organic 82-mm mortars. Unfortunately, not all ANA elements are proficient in the use of their mortars. In addition, many International Security Assistance Force forces, being Western armies, do not fully understand the capabilities and limitations or the gunnery aspects of these very important Soviet-designed ANA company-level fire support weapons. The importance of mortars to a company commander cannot be underestimated — and the ANA is no exception. However, with training and preparation, the ANA can increase the effective use of its mortars and can rely more on their own fire support and, hopefully, less on International Security Assistance Force fire support assets.

This article lays out some of the specific issues the ANA faces in the use of its mortar systems, focusing specifically on its 82-mm mortar. This article, in particular, addresses various equipment and ammunition issues, gunnery issues and important safety considerations that must be taken into account when working with the 82-mm mortar. Next, specific examples of how the ANA overcame some of these problems at the Spera Combat Outpost in eastern Afghanistan. Finally, some training techniques and recommendations are laid out to aid personnel to help the ANA improve its mortar gunnery. This article isn't a comprehensive guide to ANA 82-mm mortar gunnery. My intent is only to give future ANA advisors and International Security Assistance Force fire support personnel insight into helping the ANA use its company-level 82-mm mortars.

Description. The ANA uses Soviet-designed 82-mm mortars. Though the mortar is similar in capabilities to the U.S. 81-mm mortar, the actual weapon system has some significant differences. The A-frame supporting the mortar is not as stable as the U.S. 81-mm mortar. The base plate also is different. Unlike the U.S. 81-mm mortar, the 82-mm mortar base plate does not lay flat on the ground and set itself after one round. Rather, it is angled slightly and weighted with sandbags. This seemingly minor difference can cause significant delays in firing when the mortar has to make a large azimuth shift during fire missions.

Another difference is the high-explosive range data plate on the mortar itself. This plate actually contains the elevation settings required for a given charge and range (in 100 meter increments). Essentially, it is a very limited high-explosive range tabular firing table data. If this plate is not present, unless the gun crew has the data written down and with them, then the crew has no way to determine proper elevation and charge data for high-explosive based on the target range.

Finally, the 82-mm gun sight is azimuth based and uses the 6,000 mil system. Because it does not use any type of common deflection and it cannot be "floated," the gun must be laid at a known azimuth. The lack of a "floating" sight or common deflection causes certain azimuths to be blocked because the tube will be in the way of the sight. Because the ANA has no firing computers or comprehensive tabular firing tables, it is strongly recommended that the gun be laid at zero mils. To lay the gun on any other azimuth adds additional calculations into the firing data computations that are completely unnecessary and could slow down fire mission processing.

A final complication to the ANA use of the gun sight involves the nature of the Dari or Pashtun written languages. The ANA read from right to left while the mortar azimuth and elevation setting numbers are supposed to be read left to right. When working with the ANA mortar team, it is absolutely critical to verify its gun sight data until it is clear the team knows how to read the gun sight correctly.

Fire direction and gunnery. The ANA fire direction is quite primitive. Most ANA mortar chiefs simply lay the gun on azimuth with the target they want to engage (therefore, the mortar team must be able to see the target), estimate the range, consult the range plate on their tubes, set the range data, cut the charge on the ammunition and fire. Often a platoon leader or the company commander is there to verify the data and make corrections. Aiming poles are not used and range corrections, particularly in mountainous terrain, are either too timid or too bold. ANA fire direction does not address vertical interval corrections. The simple data plate assumes the target and gun are both at sea level — a difficult assumption to make in Afghanistan.

There are many reasons for the primitive fire direction and gunnery techniques. First of all, many ANA mortar men have not been trained in or do not understand the principles of indirect lay using an aim point (like aiming poles). Further, even fewer of their officers understand these principles. Given the old Soviet model that many of their officers know and practice, even if the mortar team understands and is willing to aim the tube off of aiming stakes, if the officer does not understand the technique, he will not allow the mortar team to do it.

Secondly, many of the ANA mortars have either missing or broken sights. The ANA also has no way to purge its sights (no nitrogen purging kits). Without an operational sight, direct lay on the target is the only technique the ANA mortar team can use. Finally, there is no tabular firing table or firing computers for the ANA to use with their mortars. This lack of tabular firing table or firing computer is the principle reason why the ANA mortar team cannot adjust for vertical interval. Another important side effect of no tabular firing table is the ANA has no way of giving a maximum ordinate of its mortar rounds. Given the high angle nature of mortars, simply assuming that the maximum ordinate is the same as an 81-mm mortar is not a good assumption.

Ammunition. Ammunition generally comes in three types: Russian/Soviet high-explosive, Chinese high-explosive, and U.S. 82-mm illumination. The first two types of ammunition do not have the same ballistic performance. As a general rule, the Chinese manufactured ammunition does not perform as well as the Russian ammunition and can fall short by as much as 50 to 100 meters when fired with the same data as the Russian ammunition. The Chinese ammunition also is more prone to hang fires. However, both rounds share a common, dangerous aspect — neither round has a minimum range "spin safety" (that is, a minimum number of times the round must spin when leaving the tube before the fuse is armed). Once the safety pin is removed from the fused mortar round, the round is armed. Other than that, the rounds are like U.S. ammunition. They may have "donut" or "cheese" charges, and these charges are "cut" just like U.S. mortar ammunition. The U.S. designed illumination does have a minimum range "spin safety"

1SG Terry Branham (right) and SPC Seth A. Hungiville (left) inspect an 82-mm mortar set-up with an Afghan National Army weapons instructor at Kabul Military Training Center, Sept. 5, 2007. (Photo by SSgt Luis P. Valdespino Jr., U.S. Marine Corps)

An Afghan National Army mortar team takes a break from training, but still maintains their position next to their mortar. (Photo by MAJ Michael J. Wood, U.S. Army)

and is much safer to handle.

When working with ANA mortar ammunition, the mortar team must take care with fused rounds. The ANA is generally aware of the dangers associated with their high-explosive rounds and does not pull the safety pin until just before they drop the round in the tube. The mortar teams are quite frugal and save their "cut" charges (U.S. mortar teams do the same). They do this because it is not uncommon for the ANA to use mortar rounds recovered from enemy caches. Often times, the rounds recovered from enemy caches do not have all (or any) of the charges with the round. To fire these rounds, the ANA will use its "saved" charges. Sometimes, these charges have been exposed to the elements or are quite old.

Observed fire. Without tabular firing tables, plotting boards or firing computers, the ANA really does not possess the capability to call for and adjust mortar fire — unless the observer is on the gun target line. Compounding this is a lack of skilled observers within the ANA. While teaching the ANA how to call for and adjust fire was not impossible, it was very difficult. But it can be done, and the fact that the 82-mm mortar is azimuth laid (as opposed to common deflection) actually makes it easier for the ANA to gain this capability. If the observer can give the ANA mortar team a target grid, the ANA can (theoretically) compute the azimuth and the range off of a map and fire on the target. Using the observer to target line factor and the mil range relationship, the guns could adjust (and this is the key reason why it is best if the mortar tubes are laid at zero mils). But the U.S. Soldier must be careful and never forget that the ANA utilizes a 6000 mil compass and gun sight.

Safety considerations. Several significant safety considerations already have been discussed — the lack of a minimum range "spin safety" on the Soviet and Chinese rounds; the fact that Chinese rounds usually fall shorter than the Russian rounds; the ANA propensity to use found or captured cache ammunition; and the lack of good fire direction tabular firing tables or firing computers to compute observer corrections, gun and target altitude data, gun and target vertical interval, or ammunition maximum ordinate. One last significant safety consideration is ANA hang fire/misfire procedures. The high-explosive rounds the ANA uses are often quite old, and the round may not fire. Compounding this issue is the fact the high-explosive rounds are fully armed when dropped in the tube. If the tube must be cleared manually, then it is critically important that it is tipped slowly and gently to allow the round to slide slowly out of the tube. The ANA soldiers I worked with understood this, but it is important the U.S. Soldiers working with the ANA understand this as well.

Challenges. The challenges the ANA mortar teams and their U.S. advisers face are difficult. Some of them can be overcome, and some cannot. The ANA, itself, has to overcome some issues, such as old ammunition, missing or damaged mortar gun sights and the lack of tabular firing tables and firing computers. But, with training, other issues can be addressed. It is possible to teach the ANA how to fire from aiming posts. It also is possible to improve the fire direction center capabilities and teach ANA mortarmen how to adjust for vertical interval errors, create known points and adjust fire for an observer.

I was part of a team of 10 U.S. embedded training teams assigned to support the approximately 100 ANA soldiers from 3/1/203rd ANA at Spera Combat Outpost in eastern Afghanistan. What follows are the techniques I used with an ANA company from 3/1/203rd ANA. The ANA company had a good mortar team, but the team was only familiar with direct lay. The ANA company commander knew that I was an artillery officer and gave his consent for me to work with his mortar section. The two ANA 82-mm mortars were the only indirect fire assets on the combat outpost.

The first challenge was convincing the leadership and the mortar team that mortars could be fired accurately using aiming stakes. Because the ANA was assuming the combat outpost from a U.S. unit that had a mortar team equipped with a 60-mm and 81-mm mortar, this task was a little easier than we expected. The U.S. mortar team demonstrated (using its own mortar systems) how the concept of laying the tube worked. It then demonstrated emplacement of aiming stakes. After working through this, the ANA mortar team chief and company commander were allowed to aim and fire the U.S. mortar using U.S. calculated fire direction center data. After the ANA understood the U.S. method, we moved to the ANA mortar and began training the mortar team.

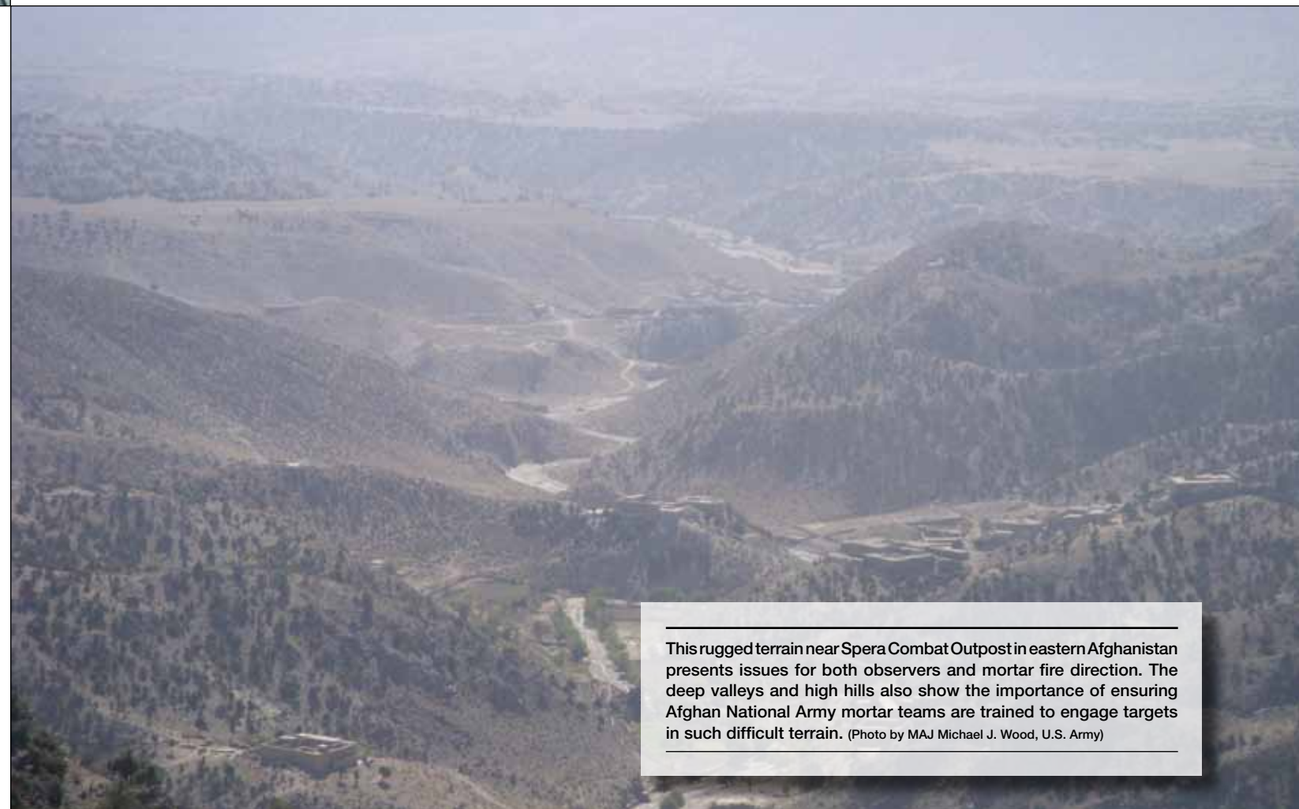
We helped the ANA establish a mortar firing position with Global Positioning System grid coordinates. We then used a declinated M2 compass and determined a zero mil azimuth. After determining this azimuth, the ANA team was trained to emplace the aiming stakes. Over a couple days, we did this several times until the ANA was comfortable with emplacing the aiming stakes on its own.

After teaching the ANA mortar team how to establish position with the Global Positioning System and directional control with a compass, we worked on establishing known points. With our help, the ANA adjusted on known points to the north, south and east of its firing position. The ANA company commander and mortar team chief recorded all of the firing data. The company commander then conducted drills with his mortar team whereby he would call off a specific target and have the team practice using the gun sight and aiming poles for laying the tube. After several of these dry fire drills, he would transition to firing live ammunition on the targets.

Despite the lack of meteorological data (though a U.S. field artillery unit confirmed that the weather remained "generally consistent" during this training) and the age of the ammunition, all of the fires would impact within about 50 meters of the known target grid (as verified with a calibrated set of Viper range finders). This training continued for about four days until the U.S. mortar team departed. After the mortar team left, the ANA became completely responsible for the defense of Spera Combat Outpost. As such, its mortars and the mortar team training took on increased importance.

At this point, it is hard to underestimate the effect of the training with the U.S. mortar team. In the case of this particular ANA mortar team, they had never fired using aiming poles nor had they ever established known points using anything other than direct lay. The U.S. mortar team also treated them as soldiers — a key point to observe when working with the ANA. The ANA respects U.S. Army capabilities and often ANA soldiers will try to emulate U.S. Soldiers. Of equal importance was the leadership of the ANA company commander. The commander was concerned about the training of his mortar team and was willing to get the ammunition necessary for the team training.

After the International Security Assistance Force left Spera Combat Outpost, the ANA commander wanted to adjust illumination on two areas that insurgent forces historically had used to engage soldiers on the Spera Combat Outpost Observation Post as well as a point on a trail they most likely had used to get to the two areas. The issue we had to overcome was there were no skilled observers



This rugged terrain near Spera Combat Outpost in eastern Afghanistan presents issues for both observers and mortar fire direction. The deep valleys and high hills also show the importance of ensuring Afghan National Army mortar teams are trained to engage targets in such difficult terrain. (Photo by MAJ Michael J. Wood, U.S. Army)

in the ANA on the observation post. Working with the commander and a map of the area, we began adjusting illumination**.** Due to the proximity of the international border, we deliberately fired the first round short of the target. The ANA NCO on the observation post then indicated which direction (left, right, closer or further) relative to his position he needed the round to go.

The commander and I worked the corrections (through an interpreter) on the map. As each correction was plotted, we calculated a new azimuth and range. The mortar chief then adjusted his tube to the new data and another adjustment round was fired. Because the ANA has no tabular firing tables, the real problem we had with this method was adjusting the time fuse setting correctly. Because the vertical interval was in excess of 300 meters, we had to slowly adjust "upward" and then "outward" on the gun target line until the illumination was optimal.

After adjusting the illumination, it became apparent we needed a method for calculating corrections due to vertical interval. Realizing the ANA was not trained in ballistics, I tried to resolve the issue and come up with an acceptable approximation. Since mortars are high angle, the last several hundred meters of the descending trajectory can be closely approximated as a straight line. Making this assumption, I then began to analyze the "should hit" and "did hit" range data from the three known high-explosive points. I compared that range data with the Viper measured data and map spotted altitudes.

Because I was assuming the last few hundred meters of descending trajectory was a line, I took data from the north and south known point and used the algebraic equation for a linear slope (y=mx + b) to try to compute an approximate vertical interval correction factor – (y is the vertical interval, x is the horizontal interval, m is the slope, and b is the vertical offset). I ended up with a correction factor that was equal to the "did hit" range correction divided by the vertical interval. After computing the correction factor, I took the "should hit" data from the east known point and after multiplying the correction factor (obtained with the north and south target data) by the vertical interval and then adding it to the "should hit" data, I compared the results to the "did hit" range data. In mathematical form, the approximation is expressed as: (Target Range) + [(Correction Factor) X (Vertical Interval)] = Adjusted Range.

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The calculated data agreed within 30 meters of the "did hit" data of the east known point despite there being a vertical interval of more than 300 meters and a range of about 2,000 meters. (It also assumes the vertical interval is positive — if the vertical interval is negative, then correction is subtracted.) A point of caution is in order — this correction was calculated for a very specific point in Afghanistan with known firing data and at a gun altitude of more than 7,000 feet. Do not assume all firing data will yield the same results. The linear approximation used is a good one, but only for high angle fire on mortars. It is significantly less accurate for low-angle cannons. This point was made very clearly to the ANA commander. To re-emphasize, this was done in a remote combat outpost under combat conditions and gave the ANA a capability to engage threats with its only indirect fire asset. And it was used only after several verification fire missions demonstrated its validity as an approximation.

After working through this, the ANA commander and the mortar team decided to try to verify my approximation calculations. After firing more than five different targets in different directions with high explosive and two more with illumination, we found the correction factor was always range accurate to within 60 meters (as measured by a Viper). This was a marked contrast to the 200, 300 and 400 meter range corrections we sometimes had to make due to the ruggedness of the terrain and huge differences in vertical interval.

Where it really paid dividends was in illumination missions by quickly giving the ANA an adjusted range for time fuse settings. Having a fairly high degree of confidence in the vertical interval adjustment calculation, the ANA began to apply the correction consistently in their firing during the next two to three weeks. An added benefit to this validation was the ANA mortar chief began to express a real interest in understanding the concepts of ballistic trajectories. In the process, he began to understand his weapons system's capabilities and limitations.

The final challenge in dealing with ANA mortar teams is not with the team itself, but with observers. The ANA simply does not have many observers with even rudimentary skills. Often, only the commander has any skills in adjusting fire. This is because many ANA soldiers cannot read anything, much less a map. Therefore, target location is sketchy at best and any corrections are "eye-balled" by ANA soldiers. There are some soldiers who can read a map, but often they read using the Russian method, hence the easting and northing are "reversed" from the NATO method. U.S. Soldiers must always verify a target grid given by the ANA if the ANA are calling in targets to any U.S. system.

Due to the operational circumstances at the Spera Combat Outpost, it was not possible to work one-on-one with the ANA observers on the observation post. In addition, the ANA mortar team has to gain the ability to use a mortar plotting board or, at the minimum, the ability to plot corrections on a map to re-compute data due to the new map spot. We did just that at the Spera Combat Outpost. I worked directly with the commander to show him how to take adjustments and re-compute range and azimuths for the mortars based off of corrections, and even though it was a slow process, the commander learned the process and quickly got better at it.

Recommendations. Working with and training the ANA is an important part to the counterinsurgency fight in Afghanistan. The ANA has several capabilities, but also has several limitations. Understanding the limitations and capabilities of company-level mortars is important in any military that uses mortars. As more and more U.S. Soldiers come in contact with the ANA, it is important they become aware of what the ANA can and cannot do. As fire supporters, we must understand ANA infantry mortars just like we understand friendly mortars. I offer several recommendations to personnel who might find themselves working with ANA mortar teams.

Get to know the mortar team members, the condition of their equipment and their company commander. The ANA mortar team is willing to work with U.S. Soldiers, but only if the commander approves.

If possible, try to get a U.S. mortar sergeant to work with the ANA team. The ANA mortar teams that I worked with greatly respected U.S. mortar sergeants. A joint ANA and U.S. mortar live fire with mixed crews can pay huge dividends by motivating the ANA to want to learn more. Make sure that if this is done, the ANA company commander is invited. Earn his respect, and he practically will beg U.S. Soldiers to train his mortar teams.

Understand the ANA mortar team members. Some of them will be very good , and some of them will not understand much of anything. Let them demonstrate their capabilities before you attempt to train with them.

Understand manual fire direction and mortar ballistics. There are no computers or tabular firing tables with the ANA mortar teams (at least I never saw one). Many times, ANA mortars will engage targets they can see or, if they are very good, targets they can compute data from off of a map.

Realize that an 82-mm mortar is not an 81-mm mortar. They may be used in the same type of role, but they are no more similar than an M4 carbine and an AK-74 assault rifle. Both mortars have a tube, a base plate, "legs," a gun sight and ammunition — and that is about the extent of their similarities.

Finding ANA soldiers who have the capability and willingness to learn how to call for and adjust fire will be extremely difficult. If you do find a willing soldier (or, more likely, officer) who has the capability to learn, than do everything you can to develop that capability.

When training with the ANA mortar teams, always try to use the same interpreter. Gunnery of any kind is full of jargon, and it is critical you ensure your interpreter understands the various gunnery terms like deflection, azimuth and lay before you try to work with the ANA. Your interpreter must understand the gunnery if he is going to interpret for you. Remember, many of these ANA mortar sergeants really do want to understand their weapons system.

Drink tea with the ANA mortar team if they invite you. You will be glad that you did. You will never get to know the ANA mortar teams until you are willing to drink tea with them.

Of course, these are only recommendations based upon my experience as an embedded training team Soldier with the ANA. As many commercials say, your individual experiences may vary, but I will say that some of my best moments in Afghanistan occurred during my work with the ANA mortars at the Spera Combat Outpost. Just like us, nothing gets them more excited than a first round hit — and with assistance, training and understanding, ANA mortar teams can do this more often than they can now.

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SPC Seth A. Hungiville (center right) inspects an 82-mm mortar set-up with an Afghan National Army weapons instructor at Kabul Military Training Center, Sept. 5, 2007. (Photo by SSgt Luis P. Valdespino Jr., U.S. Marine Corps)